

REMARKS

In the Claims

The claims are amended to use “consisting essentially of” language. New claims 38-45 correspond to already present claims 1, 2, 6, 16, 20, 30, 36, and 37, respectively; however, use the “consisting of” claim language terminology. Claims 46 and 47 are dependent claims directed to glasses containing Sb_2O_3 . Claim 48 specifies the density of the claimed glasses as discussed on page 12 of the application.

The Rejections Under 35 USC § 102

Claims 1-37 were rejected as allegedly anticipated by Peuchert et al., US 6,417,124.

The claims are amended to use the “consisting essentially of” language to exclude the “essential” MoO_3 component of the reference glasses.

The reference teaches that:

“A constituent of the glasses which is essential to the invention is MoO_3 . Even small amounts of this component produce high internal glass quality in these high-melting aluminoborosilicate glasses, i.e. high quality with respect to freedom from or a low content of bubbles and streaks. The glasses therefore contain 0.05-2% by weight, preferably 0.1-1.5% by weight, of MoO_3 .”

See column 5, lines 28-34.

“Owing to the high effectiveness of MoO_3 , the addition of further fining agents is unnecessary.”

See column 5, lines 28-34.

“The action of the MoO_3 in the glasses according to the invention goes well beyond that of a fining agent: it improves the acid resistance ... and the solarization stability. It also improves the devitrification stability. With a reduced upper devitrification limit (UDL), an increased difference T4-UDL ... arises, which means an increased processing range. In addition, it increases the corrosion resistance of Mo in contact with the glass or with the melt.”

See column 6, lines 14-21.

Thus, the “consisting essentially of” language effectively excludes MoO_3 from the claimed invention.

The Rejections Under 35 USC § 103

Claims 1-37 were rejected as allegedly unpatentable over Narita et al., US 6,468,933.

Narita teaches glasses with percent ranges of components claimed broadly. All the examples in Narita are directed to glasses that do not fall within the claims of the present application. Narita's objective is to use a combination of SnO_2 and chloride instead of As_2O_3 (widely used fining agent) as the fining agent in the glasses to obtain glasses without bubbles. See column 1, lines 43 to 58. The glasses also were evaluated for chemical resistance. See Column 6, lines 25-35. The objective of the present invention is to obtain glasses that have the concurrent presence of low density, low processing temperature, good crystallization stability and high chemical resistance. To achieve these objectives the specification teaches that:

"The glasses contain > 3 to 6% by weight of MgO and > 4.5 to 10% by weight of CaO . High levels of these two components have a positive effect on low density and low processing temperature, whereas low levels favor crystallization stability and chemical resistance. The MgO level is preferably lower than the CaO level by weight. The MgO/CaO ratio by weight is < 1 , preferably ≤ 0.7 . Preference is given to a maximum MgO content of 5% by weight and to a minimum CaO content of 5% by weight.

The glasses contain at least $> 1.5\%$ by weight BaO . The maximum BaO content is limited to 6.0% by weight, preferably to 5.0% by weight. This ensures good meltability and keeps the density low. Preference is given to a minimum BaO content of $> 2.5\%$ by weight. This increases the crystallization stability.

The glasses may furthermore contain up to $< 4\%$ by weight, preferably up to 3% by weight, the relatively heavy alkaline earth metal oxide SrO . Limitation of this optional component to a maximum of $< 4\%$ by weight is advantageous to ensure good meltability and a high chemical resistance. To achieve a very low density, the SrO content is preferably limited to a maximum of 1.5% by weight. Thus, glasses having a very low density are obtained by using BaO contents of $> 1.5\%$ by weight in the case of glasses having no or low SrO content, i.e., glasses having an SrO content of $0 - 1.5\%$ by weight.

Glasses having relatively high BaO contents of $> 2.5\%$ by weight exhibit particularly high crystallization stability at SrO contents of 0 to $< 4\%$ by weight, preferably up to 3% by weight.

The total content of BaO and SrO together in these two groups of glasses is at least $> 3\%$ by weight. This ensures sufficient crystallization stability. SrO and BaO have a positive effect on HCl resistance of the glasses and they also reduce the refractive index of the glasses when comparing the effect of MgO and CaO in the glasses."

See page 6, last paragraph, to page 7 in its entirety, for example. Thus, a careful balancing of the amount of these components is necessary to obtain the glasses of the present invention. None of the examples satisfy the required relationship between MgO and CaO in the claimed ranges. No teaching or suggestion is present in Narita that would provide the necessary motivation to one of skill in the art to select these components at the specified weight percentages to achieve the presently claimed glasses having the desired properties. Thus, the claims are not obvious.

With respect to dependent claims 46 and 47, Narita teaches that Sb_2O_3 should not be used (see column 3, lines 46-49), while claims 1 and 3 of Narita specify that the glasses are “free of Sb_2O_3 .” Thus, Narita specifically teaches away from claims specifically directed to embodiments having Sb_2O_3 as one of the components of the glass.

Claims 1-37 were rejected as allegedly unpatentable over Watzke et al., DE 196 01 922 A1.

Watzke also teaches glasses with percent ranges of components claimed broadly. All the examples in Watzke are directed to glasses that do not fall within the claims of the present application. The objective of the present invention is to obtain glasses that have the concurrent presence of low density, low processing temperature, good crystallization stability and high chemical resistance. See page 6, last paragraph, to page 7 in its entirety, for example. A careful balancing of the amount of these components is necessary to obtain the glasses of the present invention, as discussed above. Watzke exemplifies only MgO, CaO and SrO contents in his glasses, which are not even within the claimed ranges. No teaching or suggestion is present in Watzke that would provide the necessary motivation to one of skill in the art to select the components at the specified weight percentages to achieve the presently claimed glasses having the desired properties. Thus, the claims are not obvious.

Claims 1-37 were rejected as allegedly unpatentable over Lautenschläger et al., US 6,465,381.

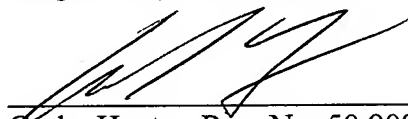
Lautenschläger also teaches glasses with percent ranges of components claimed broadly. All the examples in Lautenschläger are directed to glasses that do not fall within the claims of the present application. The objective of the present invention is to obtain glasses

that have the concurrent presence of low density, low processing temperature, good crystallization stability and high chemical resistance. See page 6, last paragraph, to page 7 in its entirety, for example. A careful balancing of the amount of these components is necessary to obtain the glasses of the present invention, as discussed above. No example in the reference satisfies the balancing of all 4 of these components in a way to satisfy the requirements of the present invention. No teaching or suggestion is present in Lautenschläger that would provide the necessary motivation to one of skill in the art to select the components at the specified weight percentages to achieve the presently claimed glasses. Thus, the claims are not obvious.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version With Markings To Show Changes Made**".

The Commissioner is hereby authorized to charge any fees associated with this response or credit any overpayment to Deposit Account No. 13-3402.

Respectfully submitted,



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Version With Markings To Show Changes Made

In the Claims

The claims have been amended as follows:

1. (Amended) An alkali-free aluminoborosilicate glass ~~comprising~~ consisting essentially of by weight % based on oxide,

SiO ₂	> 58 – 65,
B ₂ O ₃	> 6 – 11.5,
Al ₂ O ₃	> 14 – 20,
MgO	> 3 – 6,
CaO	> 4.5 – 10,
SrO	0 – 1.5,
BaO	> 1.5 – 6,
with SrO + BaO	> 3, and
ZnO	0 – < 2,

and essentially no alkali oxides.

2. (Amended) An alkali-free aluminoborosilicate glass ~~comprising~~ consisting essentially of by weight % based on oxide,

SiO ₂	> 58 – 65,
B ₂ O ₃	> 6 – 11.5,
Al ₂ O ₃	> 14 – 20,
MgO	> 3 – 6,
CaO	> 4.5 – 10,
SrO	0 – < 4,
BaO	> 2.5 – 6,
with SrO + BaO	> 3, and
ZnO	0 – 0.5,

and essentially no alkali oxides.

3. (Amended) An aluminoborosilicate glass according to Claim 1, ~~comprising~~ containing at most 5% by weight MgO based on oxide.

4. (Amended) An aluminoborosilicate glass according to Claim 1, ~~comprising~~ containing at least 60% by weight SiO₂ based on oxide.

5. (Amended) An aluminoborosilicate glass according to Claim 1, comprising containing more than 11% by weight MgO, CaO, SrO and BaO together based on oxide.

6. (Amended) ~~An aluminoborosilicate glass according to Claim 1, further comprising by weight % based on oxide,~~ An alkali-free aluminoborosilicate glass consisting essentially of by weight % based on oxide,

<u>SiO₂</u>	<u>> 58 – 65,</u>
<u>B₂O₃</u>	<u>> 6 – 11.5,</u>
<u>Al₂O₃</u>	<u>> 14 – 20,</u>
<u>MgO</u>	<u>> 3 – 6,</u>
<u>CaO</u>	<u>> 4.5 – 10,</u>
<u>SrO</u>	<u>0 – 1.5,</u>
<u>BaO</u>	<u>> 1.5 – 6,</u>
<u>with SrO + BaO</u>	<u>≥ 3,</u>
<u>ZnO</u>	<u>0 – < 2,</u>
<u>ZrO₂</u>	<u>0 – 2,</u>
<u>TiO₂</u>	<u>0 – 2,</u>
<u>With ZrO₂ + TiO₂</u>	<u>0 – 2,</u>
<u>As₂O₃</u>	<u>0 – 1.5,</u>
<u>Sb₂O₃</u>	<u>0 – 1.5,</u>
<u>SnO₂</u>	<u>0 – 1.5,</u>
<u>CeO₂</u>	<u>0 – 1.5,</u>
<u>Cl⁻</u>	<u>0 – 1.5,</u>
<u>F⁻</u>	<u>0 – 1.5,</u>
<u>SO₄²⁻</u>	<u>0 – 1.5, and</u>
<u>Wherein As₂O₃ + Sb₂O₃ + SnO₂ + CeO₂ + Cl⁻</u>	
<u>+ F⁻ + SO₄²⁻</u>	<u>0 – 1.5,</u>

and essentially no alkali oxides.

10. (Amended) An aluminoborosilicate glass according to claim 1, comprising containing at least 5% by weight CaO based on oxide.

11. (Amended) An aluminoborosilicate glass according to claim 1, comprising containing > 7 to ≤11% by weight B₂O₃ based on oxide.

12. (Amended) An aluminoborosilicate glass according to claim 1, comprising containing > 2.5% to ≤5% by weight BaO based on oxide.

13. (Amended) An aluminoborosilicate glass according to claim 1, comprising containing more than 3% by weight SrO and BaO together based on oxide.

14. (Amended) An aluminoborosilicate glass according to claim 1, comprising containing up to 0.5% by weight ZnO based on oxide.

15. (Amended) An aluminoborosilicate glass according to claim 1, comprising containing up to 1.5% by weight ZnO based on oxide.

16. (Amended) ~~An aluminoborosilicate glass according to claim 1, further comprising independently of one another at most 0.5% ZrO₂ and TiO₂ each by weight based on oxide.~~ An alkali-free aluminoborosilicate glass consisting essentially of by weight % based on oxide,

<u>SiO₂</u>	<u>> 58 – 65,</u>
<u>B₂O₃</u>	<u>> 6 – 11.5,</u>
<u>Al₂O₃</u>	<u>> 14 – 20,</u>
<u>MgO</u>	<u>> 3 – 6,</u>
<u>CaO</u>	<u>> 4.5 – 10,</u>
<u>SrO</u>	<u>0 – 1.5,</u>
<u>BaO</u>	<u>> 1.5 – 6,</u>
<u>with SrO + BaO</u>	<u>> 3,</u>
<u>ZnO</u>	<u>0 – < 2,</u>
<u>ZrO₂</u>	<u>≤ 0.5, and</u>
<u>TiO₂</u>	<u>≤ 0.5,</u>

and essentially no alkali oxides.

17. (Amended) An aluminoborosilicate glass according to Claim 2, comprising containing at most 5% by weight MgO based on oxide.

18. (Amended) An aluminoborosilicate glass according to Claim 2, comprising containing at least 60% by weight SiO₂ based on oxide.

19. (Amended) An aluminoborosilicate glass according to Claim 2, comprising containing more than 11% by weight based on oxide MgO, CaO, SrO and BaO is greater together.

20. (Amended) ~~An aluminoborosilicate glass according to Claim 2, further comprising by weight % based on oxide,~~ An alkali-free aluminoborosilicate glass consisting essentially of by weight % based on oxide,

<u>SiO₂</u>	<u>> 58 – 65,</u>
<u>B₂O₃</u>	<u>> 6 – 11.5,</u>
<u>Al₂O₃</u>	<u>> 14 – 20,</u>
<u>MgO</u>	<u>> 3 – 6,</u>
<u>CaO</u>	<u>> 4.5 – 10,</u>
<u>SrO</u>	<u>0 – < 4,</u>
<u>BaO</u>	<u>> 2.5 – 6,</u>
<u>with SrO + BaO</u>	<u>≥ 3,</u>
<u>ZnO</u>	<u>0 – 0.5,</u>
<u>ZrO₂</u>	<u>0 – 2,</u>
<u>TiO₂</u>	<u>0 – 2,</u>
<u>with ZrO₂ + TiO₂</u>	<u>0 – 2,</u>
<u>As₂O₃</u>	<u>0 – 1.5,</u>
<u>Sb₂O₃</u>	<u>0 – 1.5,</u>
<u>SnO₂</u>	<u>0 – 1.5,</u>
<u>CeO₂</u>	<u>0 – 1.5,</u>
<u>Cl⁻</u>	<u>0 – 1.5,</u>
<u>F⁻</u>	<u>0 – 1.5,</u>
<u>SO₄²⁻</u>	<u>0 – 1.5, and</u>
<u>Wherein As₂O₃ + Sb₂O₃ + SnO₂ + CeO₂ + Cl⁻</u>	
<u>+ F⁻ + SO₄²⁻</u>	<u>0 – 1.5,</u>

and essentially no alkali oxides.

24. (Amended) An aluminoborosilicate glass according to claim 2, ~~comprising~~ containing at least 5% by weight CaO based on oxide.

25. (Amended) An aluminoborosilicate glass according to claim 2, ~~comprising~~ containing > 7 to ≤11% by weight B₂O₃ based on oxide.

26. (Amended) An aluminoborosilicate glass according to claim 2, ~~comprising~~ containing > 2.5% to ≤5% by weight BaO based on oxide.

27. (Amended) An aluminoborosilicate glass according to claim 2, ~~comprising~~ containing more than 3% by weight SrO and BaO together based on oxide.

28. (Amended) An aluminoborosilicate glass according to claim 2, ~~comprising~~ containing up to 0.5% by weight ZnO based on oxide.

29. (Amended) An aluminoborosilicate glass according to claim 2, ~~comprising~~ containing up to 1.5% by weight ZnO based on oxide.

30. (Amended) ~~An aluminoborosilicate glass according to claim 2, further comprising independently of one another at most 0.5% ZrO₂ and TiO₂ each by weight based on oxide.~~ An alkali-free aluminoborosilicate glass consisting essentially of by weight % based on oxide,

<u>SiO₂</u>	<u>> 58 – 65,</u>
<u>B₂O₃</u>	<u>> 6 – 11.5,</u>
<u>Al₂O₃</u>	<u>> 14 – 20,</u>
<u>MgO</u>	<u>> 3 – 6,</u>
<u>CaO</u>	<u>> 4.5 – 10,</u>
<u>SrO</u>	<u>0 – < 4,</u>
<u>BaO</u>	<u>> 2.5 – 6,</u>
<u>with SrO + BaO</u>	<u>≥ 3,</u>
<u>ZnO</u>	<u>0 – 0.5,</u>
<u>ZrO₂</u>	<u>≤ 0.5, and</u>
<u>TiO₂</u>	<u>≤ 0.5,</u>

and essentially no alkali oxides.

31. (Amended) An aluminosilicate glass according to claim 2, ~~comprising~~ containing up to 3% by weight SrO based on oxide.

36. (Amended) An alkali-free aluminoborosilicate glass ~~comprising~~ containing less than 1500 ppm alkali metal oxides and ~~comprising~~ consisting essentially of by weight % based on oxide,

SiO ₂	> 58 – 65,
B ₂ O ₃	> 6 – 11.5,
Al ₂ O ₃	> 14 – 20,
MgO	> 3 – 6,

CaO	> 4.5 – 10,
SrO	0 – 1.5,
BaO	> 1.5 – 6,
with SrO + BaO	> 3, and
ZnO	0 – < 2,

and essentially no alkali oxides.

37. (Amended) An alkali-free aluminoborosilicate glass ~~comprising~~ containing less than 1500 ppm alkali metal oxides and ~~comprising~~ consisting essentially of by weight % based on oxide,

SiO ₂	> 58 – 65,
B ₂ O ₃	> 6 – 11.5,
Al ₂ O ₃	> 14 – 20,
MgO	> 3 – 6,
CaO	> 4.5 – 10,
SrO	0 – < 4,
BaO	> 2.5 – 6,
with SrO + BaO	> 3, and
ZnO	0 – 0.5,

and essentially no alkali oxides.

Claims 38-48 have been newly added.